

indicate the changes made.

-- This is followed by applying an opaque material onto the substrate. The opaque material may be applied as a liquid coating, such as a polymeric material dissolved in a suitable solvent system. Alternatively, it may be extruded onto the substrate as a melted thermoplastic resin. The thickness of the layer of opaque material is determined by the volume of the interstices between microspheres. These interstices should be filled. Is the opaque material is applied by a solvent based coating process, it is convenient to partially dry the coating, apply the microspheres, typically by drop coating, and press them into contact with surface 3 (Figure 1).

After the microspheres have been pressed into place, the drying of opaque material may be completed. Preferably, prior to application, the microspheres are treated with a fluorochemical compound as disclosed in U.S. Pat. No. 3,222,204 (Weber). --

#### IN THE CLAIMS

Please cancel claims 11-20 without prejudice. Please amend claims 1, 9, 10, and 18; and add claims 21-37. The new and amended claims are provided below in clean form. Per 37 C.F.R. 1.121, amended claims are also shown in Appendix A with notations to indicate changes made (for convenience, all pending claims, including those added hereby, are provided in Appendix A).

1. (AMENDED)A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres:

have an average index of refraction of no greater than about 1.50 to about 1.70;  
comprise, on a theoretical oxide basis based on the amount of starting materials:  
greater than about 5 wt-% total of an alkali metal oxide selected from the group of Na<sub>2</sub>O, K<sub>2</sub>O, Li<sub>2</sub>O, and combinations thereof;  
no greater than about 40 wt-% SiO<sub>2</sub>; and  
no less than about 10 wt-% TiO<sub>2</sub>; and

as produced have less than about 15% defects in a population, and include less than the total amount of alkali metal oxide than the theoretical amount based on the amount of starting materials.

2. (AMENDED) The rear projection screen of claim 1 wherein the glass microspheres comprise, on a theoretical oxide basis based on starting materials:

no greater than about 40 wt-%  $\text{SiO}_2$ ;

no less than about 10 wt-%  $\text{TiO}_2$ ;

no less than about 20 wt-% total of an alkaline earth modifier selected from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and combinations thereof; and

greater than about 5 wt-% total of an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof.

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3. (AMENDED) The rear projection screen of claim 1 wherein the glass microspheres comprise, on a theoretical oxide basis based on starting materials:

no greater than about 31 wt-%  $\text{SiO}_2$ ;

no less than about 15 wt-%  $\text{TiO}_2$ ;

no less than about 25 wt-% total of an alkaline earth modifier selected from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and combinations thereof; and

no less than about 10 wt-% total of an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof.

4. (AMENDED) The rear projection screen of claim 1 wherein the microspheres have an average index of refraction of about 1.60 to about 1.70.
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9. (AMENDED) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres:

have an average index of refraction of no greater than about 1.70;  
comprise, on a theoretical oxide basis based on the amount of starting materials:

no greater than about 40 wt-%  $\text{SiO}_2$ ;

no less than about 10 wt-%  $\text{TiO}_2$ ;

no less than about 20 wt-% total of an alkaline earth modifier selected  
from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and mixtures thereof; and

greater than about 5 wt-% total of an alkali metal oxide selected from the  
group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof, and

wherein the microspheres include less than the total amount of alkali metal  
oxide than the theoretical amount based on the amount of starting materials.

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10. (AMENDED) A film comprising a plurality of glass microspheres disposed on a substrate  
and embedded in an opaque matrix; wherein the glass microspheres:

have an average index of no greater than about 1.50 to 1.70;

comprise, on a theoretical oxide basis based on the amount of starting materials:

greater than about 5 wt-% total of an alkali metal oxide selected from the  
group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof, with the proviso that  $\text{Li}_2\text{O}$  is  
present;

no greater than about 40 wt-%  $\text{SiO}_2$ ; and

no less than about 10 wt-%  $\text{TiO}_2$ ; and

as produced, have less than about 15% defects in a population, and included less  
than the total amount of alkali metal oxide than the theoretical amount based on  
the amount of starting materials.

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21. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical  
contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres  
have an average index of refraction of no greater than about 1.70 and comprise:  $\text{SiO}_2$ ;  
 $\text{TiO}_2$ ; and an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and

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combinations thereof; and further wherein, as produced, the microspheres have no greater than about a 15% defect level in a population.

22. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise:  $\text{SiO}_2$ ;  $\text{TiO}_2$ ; an alkaline earth modifier selected from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and combinations thereof; and an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof.

23. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres have an index of refraction of no greater than about 1.70 and comprise:  $\text{SiO}_2$ ;  $\text{TiO}_2$ ; an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof; and further wherein the glass microspheres are prepared from a composition that melts below a temperature of about  $1350^\circ\text{C}$ .

24. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres have an index of refraction of no greater than about 1.70 and comprise, on a theoretical oxide basis, based on the amount of starting materials:

no greater than about 40 wt-%  $\text{SiO}_2$ ;

no less than about 10 wt-%  $\text{TiO}_2$ ;

no less than about 20 wt-% total of one or more alkaline earth modifiers selected from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and combinations thereof; and

greater than about 5 wt-% total of one or more alkali metal oxides selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof;

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wherein, as produced, the microspheres include less than the total amount of alkali metal oxide than the theoretical amount based on the amount of starting materials.

25. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres have an index of refraction of no greater than about 1.70 and comprise, on a theoretical oxide basis, based on the amount of starting materials:

no greater than about 40 wt-%  $\text{SiO}_2$ ;

no less than about 10 wt-%  $\text{TiO}_2$ ;

no less than about 20 wt-% total of BaO and SrO; and

greater than about 5 wt-% total of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ ;

wherein, as produced, the microspheres include less than the total amount of alkali metal oxide than the theoretical amount based on the amount of starting materials.

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26. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise, on a theoretical oxide basis, based on the amount of starting materials:

no greater than about 40 wt-%  $\text{SiO}_2$ ;

no less than about 10 wt-%  $\text{TiO}_2$ ;

an alkaline earth modifier selected from the group of BaO, SrO, and combinations thereof; and

an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof

27. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise:

SiO<sub>2</sub>;

TiO<sub>2</sub>;

an alkaline earth modifier selected from the group of BaO, SrO, and combinations thereof;

an alkali metal oxide selected from the group of Na<sub>2</sub>O, K<sub>2</sub>O, Li<sub>2</sub>O, and combinations thereof; and

a component selected from the group of ZnO, Al<sub>2</sub>O<sub>3</sub>, As<sub>2</sub>O<sub>3</sub>, CaO, and combinations thereof.

28. (NEW) A rear projection screen comprising a plurality of glass microspheres in optical contact with a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise, on a theoretical oxide basis, based on the amount of starting materials:

no greater than about 40 wt-% SiO<sub>2</sub>;

no less than about 10 wt-% TiO<sub>2</sub>;

an alkaline earth modifier selected from the group of BaO, SrO, and combinations thereof;

an alkali metal oxide selected from the group of Na<sub>2</sub>O, K<sub>2</sub>O, Li<sub>2</sub>O, and combinations thereof; and

no greater than about 10 wt-% total of a component selected from the group of ZnO, Al<sub>2</sub>O<sub>3</sub>, As<sub>2</sub>O<sub>3</sub>, CaO, and combinations thereof.

29. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise: SiO<sub>2</sub>; TiO<sub>2</sub>; and an alkali metal oxide selected from the group of Na<sub>2</sub>O, K<sub>2</sub>O, Li<sub>2</sub>O, and combinations thereof; and further wherein, as produced, the microspheres have less than about a 15% defect level in a population.

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30. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise:  $\text{SiO}_2$ ;  $\text{TiO}_2$ ; and an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof; wherein the microspheres are prepared from a composition that melts below a temperature of about  $1350^\circ\text{C}$ ; and further wherein, as produced, the microspheres have no greater than about a 15% defect level in a population, and include less than the total amount of alkali metal oxide than the theoretical amount based on the amount of starting materials.

31. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise:  $\text{SiO}_2$ ;  $\text{TiO}_2$ ; an alkaline earth modifier selected from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and combinations thereof; and an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof.

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A-4 32. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres:

- have an average index of refraction of no greater than about 1.70;
- comprise, on a theoretical oxide basis, based on the amount of starting materials:
  - no greater than about 40 wt-%  $\text{SiO}_2$ ;
  - no less than about 10 wt-%  $\text{TiO}_2$ ;
  - no less than about 20 wt-% total of one or more alkaline earth modifiers selected from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and combinations thereof; and
  - greater than about 5 wt-% total of one or more alkali metal oxides selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof;
- wherein, as produced, the microspheres have no greater than about 15% defects in a population, and include less than the total amount of alkali metal oxide than the theoretical amount based on the amount of starting materials.

33. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres:
- have an average index of refraction of no greater than about 1.70;
  - comprise, on a theoretical oxide basis, based on the amount of starting materials:
    - no greater than about 40 wt-%  $\text{SiO}_2$ ;
    - no less than about 10 wt-%  $\text{TiO}_2$ ;
    - no less than about 20 wt-% total of  $\text{BaO}$  and  $\text{SrO}$ ; and
    - greater than about 5 wt-% total of  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$ ;
  - wherein, as produced, the microspheres have no greater than about 15% defects in a population, and include less than the total amount of alkali metal oxide than the theoretical amount based on the amount of starting materials.

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34. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise, on a theoretical oxide basis, based on the amount of starting materials:
- no greater than about 40 wt-%  $\text{SiO}_2$ ;
  - no less than about 10 wt-%  $\text{TiO}_2$ ;
  - an alkaline earth modifier selected from the group of  $\text{BaO}$ ,  $\text{SrO}$ , and combinations thereof; and
  - an alkali metal oxide selected from the group of  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{Li}_2\text{O}$ , and combinations thereof.
35. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise:
- $\text{SiO}_2$ ;



TiO<sub>2</sub>;

an alkaline earth modifier selected from the group of BaO, SrO, and combinations thereof;

an alkali metal oxide selected from the group of Na<sub>2</sub>O, K<sub>2</sub>O, Li<sub>2</sub>O, and combinations thereof; and

a component selected from the group of ZnO, Al<sub>2</sub>O<sub>3</sub>, As<sub>2</sub>O<sub>3</sub>, CaO, and combinations thereof.

36. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise, on a theoretical oxide basis, based on the amount of starting materials:

no greater than about 40 wt-% SiO<sub>2</sub>;

no less than about 10 wt-% TiO<sub>2</sub>;

an alkaline earth modifier selected from the group of BaO, SrO, and combinations thereof;

an alkali metal oxide selected from the group of Na<sub>2</sub>O, K<sub>2</sub>O, Li<sub>2</sub>O, and combinations thereof; and

no greater than about 10 wt-% total of a component selected from the group of ZnO, Al<sub>2</sub>O<sub>3</sub>, As<sub>2</sub>O<sub>3</sub>, CaO, and combinations thereof.

37. (NEW) A film comprising a plurality of glass microspheres disposed on a substrate comprising an acrylic and embedded in an opaque matrix; wherein the glass microspheres have an average index of refraction of no greater than about 1.70 and comprise: SiO<sub>2</sub>; TiO<sub>2</sub>; an alkaline earth modifier selected from the group of BaO, SrO, and combinations thereof; and an alkali metal oxide selected from the group of Na<sub>2</sub>O, K<sub>2</sub>O, Li<sub>2</sub>O, and combinations thereof.
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